Severity of neuropsychological impairment in cocaine addiction: association with metabolism in the brain reward circuit

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Despite the growth of the research on the cognitive deficits in cocaine abusers, the extent of these deficits is uncertain and the study of their putative neuropathological mechanisms is still in its infancy. We used exploratory and confirmatory statistical approaches to study the severity of neuropsychological impairment in 42 crack/cocaine addicted subjects and in 112 comparison subjects (40 alcoholics and 72 controls). Twenty neuropsychological test indices most reliably defining predetermined cognitive domains were submitted to exploratory factor analysis. A four-dimensional model of neurocognitive function was derived: Premorbid functioning, Visual Memory, Verbal Memory, and Attention/Executive functioning accounted for 63% of the variance. We then examined this model's association with resting glucose metabolism in the brain reward circuit measured with 2-deoxy-2[18F]fluoro-D-glucose positron emission tomography. Results revealed that (1) cocaine addicted individuals had a generalized mild level of neurocognitive impairment (< 1 SD below control mean); and (2) controlling for age and education, relative metabolism in the dorsolateral prefrontal cortex significantly predicted the Visual Memory and Verbal Memory factors and relative metabolism in the anterior cingulate gyrus significantly predicted the Attention/Executive factor. We conclude that relative to other psychopathological disorders (such as schizophrenia), the severity of neuropsychological impairment in cocaine addiction is modest, albeit not indicative of the absence of neurocognitive dysfunction, and seems to reflect changes in prefrontal brain activity. Tasks that simulate real-life decision-making might offer greater sensitivity in documenting the cognitive-behavioral and motivational-emotional changes that are known to accompany drug addiction.